

$$\frac{\text{grams of uranium} - 235}{X} + \frac{\text{grams of other fissile material}}{Y} \leq 1$$

for an individual consignment, where X and Y are the mass limits defined in table following paragraph (a)(3) of this section, provided that:

(1) Each package contains no more than 15 g of fissile material. For unpackaged material the mass limit of 15g applies to the conveyance; or

(2) The fissile material consists of a homogeneous hydrogenous solution or mixture where the minimum ratio of

hydrogen atoms to fissile radionuclide atoms (H/X) is 5200 and the maximum concentration of fissile radionuclides within a package is 5 g/liter; or

(3) There is no more than 5g of fissile material in any 10 liter volume of material and the material is packaged so as to maintain this limit of fissile radionuclide concentration during normal transport.

THE REQUIREMENTS FOR PACKAGES CONTAINING FISSILE MATERIAL

Fissile material	Fissile material mass (g) mixed with substances having an average hydrogen density less than or equal to water	Fissile material mass (g) mixed with substances having an average hydrogen density greater than water
Uranium-235(X)	400	290
Other fissile material(Y)	250	180

(b) Uranium enriched in uranium-235 to a maximum of 1 percent by weight, and with total plutonium and uranium-233 content of up to 1 percent of the mass of uranium-235, provided that the fissile material is distributed homogeneously throughout the package contents and does not form a lattice arrangement within the package.

(c) Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2 percent by weight, with a total plutonium and uranium-233 content not exceeding 0.1 percent of the mass of uranium-235, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2.

(d) Plutonium, less than 1 kg, of which not more than 20 percent by mass may consist of plutonium-239, plutonium-241, or any combination of these radionuclides.

[62 FR 5913, Feb. 10, 1997]

§ 71.55 General requirements for fissile material packages.

(a) A package used for the shipment of fissile material must be designed and constructed in accordance with

§§ 71.41 through 71.47. When required by the total amount of radioactive material, a package used for the shipment of fissile material must also be designed and constructed in accordance with § 71.51.

(b) Except as provided in paragraph (c) of this section, a package used for the shipment of fissile material must be so designed and constructed and its contents so limited that it would be subcritical if water were to leak into the containment system, or liquid contents were to leak out of the containment system so that, under the following conditions, maximum reactivity of the fissile material would be attained:

(1) The most reactive credible configuration consistent with the chemical and physical form of the material;

(2) Moderation by water to the most reactive credible extent; and

(3) Close full reflection of the containment system by water on all sides, or such greater reflection of the containment system as may additionally be provided by the surrounding material of the packaging.

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(c) The Commission may approve exceptions to the requirements of paragraph (b) of this section if the package incorporates special design features that ensure that no single packaging error would permit leakage, and if appropriate measures are taken before each shipment to ensure that the containment system does not leak.

(d) A package used for the shipment of fissile material must be so designed and constructed and its contents so limited that under the tests specified in § 71.71 ("Normal conditions of transport")—

(1) The contents would be subcritical;

(2) The geometric form of the package contents would not be substantially altered;

(3) There would be no leakage of water into the containment system unless, in the evaluation of undamaged packages under § 71.59(a)(1), it has been assumed that moderation is present to such an extent as to cause maximum reactivity consistent with the chemical and physical form of the material; and

(4) There will be no substantial reduction in the effectiveness of the packaging, including:

(i) No more than 5 percent reduction in the total effective volume of the packaging on which nuclear safety is assessed;

(ii) No more than 5 percent reduction in the effective spacing between the fissile contents and the outer surface of the packaging; and

(iii) No occurrence of an aperture in the outer surface of the packaging large enough to permit the entry of a 10 cm (4 in) cube.

(e) A package used for the shipment of fissile material must be so designed and constructed and its contents so limited that under the tests specified in § 71.73 ("Hypothetical accident conditions"), the package would be subcritical. For this determination, it must be assumed that:

(1) The fissile material is in the most reactive credible configuration consistent with the damaged condition of the package and the chemical and physical form of the contents;

(2) Water moderation occurs to the most reactive credible extent consistent with the damaged condition of

the package and the chemical and physical form of the contents; and

(3) There is full reflection by water on all sides, as close as is consistent with the damaged condition of the package.

[60 FR 50264, Sept. 28, 1995; 61 FR 28724, June 6, 1996]

§ 71.57 [Reserved]

§ 71.59 Standards for arrays of fissile material packages.

(a) A fissile material package must be controlled by either the shipper or the carrier during transport to assure that an array of such packages remains subcritical. To enable this control, the designer of a fissile material package shall derive a number "N" based on all the following conditions being satisfied, assuming packages are stacked together in any arrangement and with close full reflection on all sides of the stack by water:

(1) Five times "N" undamaged packages with nothing between the packages would be subcritical;

(2) Two times "N" damaged packages, if each package were subjected to the tests specified in § 71.73 ("Hypothetical accident conditions") would be subcritical with optimum interspersed hydrogenous moderation; and

(3) The value of "N" cannot be less than 0.5.

(b) The transport index based on nuclear criticality control must be obtained by dividing the number 50 by the value of "N" derived using the procedures specified in paragraph (a) of this section. The value of the transport index for nuclear criticality control may be zero provided that an unlimited number of packages is subcritical such that the value of "N" is effectively equal to infinity under the procedures specified in paragraph (a) of this section. Any transport index greater than zero must be rounded up to the first decimal place.

(c) Where a fissile material package is assigned a nuclear criticality control transport index—

(1) Not in excess of 10, that package may be shipped by any carrier, and that carrier provides adequate criticality control by limiting the sum of